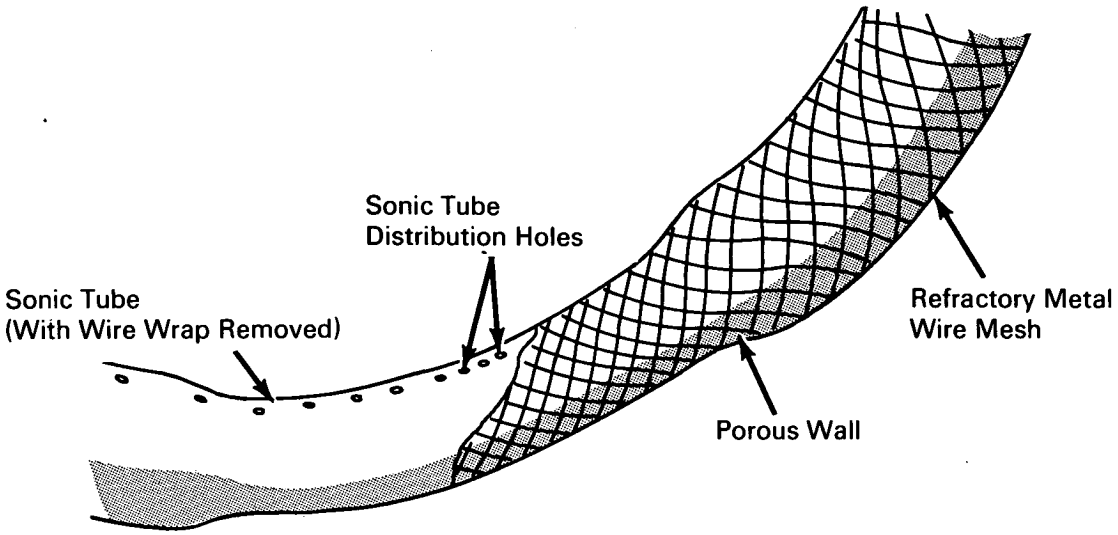
December 1966 Brief 66-10643

NASA TECH BRIEF

Combustion Chamber Struts Can Be Effectively Transpiration Cooled



The problem:

To increase the feasible temperature range of transpiration-cooled structural members in combustion chambers by a factor of at least 3. Large toroidal combustion chambers depend on high pressure (2500 psi) operation for maximum efficiency and subject the sonic throat struts to extreme thermal loadings.

The solution:

A vapor-deposited sintering technique that may be used to produce a porous mass of refractory metal wires around a combustion chamber structural member. The porous mass acts as a transpiration-cooled surface for a thick-walled tube.

How it's done:

The sonic toroidal tube is perforated with a series of slots or holes to effect preferential distribution of the required coolant through the wire mesh and over the surface as heat transfer rates dictate. Refractory metal wire, 0.010 inch in diameter is wrapped around the tube into a mesh at 45° angles and bonded together and to the tube by vapor deposition of additional refractory metal in an inert atmosphere at 600°–800°F.

Notes:

1. With this design, it is believed the maximum allowable gas side temperature could go to 3000°–4000°F compared to present materials at 1000°F and coolant requirements could be reduced to one third or one fourth that used with conventional wire materials.
2. This development is in conceptual stage only, and as of date of publication of this Tech Brief, neither a model nor a prototype has been constructed.

(continued overleaf)

3. Inquiries concerning this innovation may be directed to:

Technology Utilization Officer
Marshall Space Flight Center
Huntsville, Alabama 35812
Reference: B66-10643

Patent status:

No patent action is contemplated by NASA.

Source: G. H. Palmer
of North American Aviation, Inc.
under contract to
Marshall Space Flight Center
(M-FS-1830)